959,348

PATENT SPECIFICATION

DRAWINGS ATTACHED

959,348

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International Classification:—**H 02 k** (H 01 d)

COMPLETE SPECIFICATION

Brakemotors

We, GENERAL DYNAMICS CORPORATION, a corporation organized and existing under the laws of the State of Delaware, United States of America, located at 163 Avenue A, Bayonne, State of New Jersey, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to an electric motor having braking means, and more particularly to an AC motor having an electromechanical braking means which is energised by rectified DC current derived from the AC power delivered to the stator of the motor.

It is an object of the present invention to provide an AC motor having a DC brake energised through a rectifier from the AC line and having the brake magnet and motor housing contained in one integral casting.

This invention consists in an electric motor apparatus including a multi-phase AC motor having a stator and a multi-phase winding thereon, a rotor including a shaft portion, a housing enclosing said motor, DC brake means for the motor mechanically coupled to the rotor shaft, said brake means including an electromagnet frame integrally formed with said housing, a DC electromagnet winding on said frame, and a plurality of rectifier means interconnected between a stator phase winding and a common point, said DC winding bridging said common point and the stator neutral, for supplying rectified DC current to energise said electromagnet during operation of said motor.

The invention will now be described by way of example with reference to the accompanying drawings wherein:—

Fig. 1 is a partially sectioned elevation of a motor embodying the principles of the invention;

Fig. 2 is a fragmentary elevation of the brake means;

Fig. 3 is a fragmentary cutaway perspective view of the brake means; and

Fig. 4 is a simplified schematic diagram of the rectifier circuit.

Referring now to the drawings, and particularly Figs. 1—3, an AC motor is designated generally by the reference numeral 10. This is a standard three-phase AC induction motor having the usual stator winding 11 (see Fig. 4) and a squirrel cage rotor of the usual construction (not shown) having a shaft 12 thereon which rotates during operation of the motor to deliver rotary power as desired. The motor is enclosed in housing 13 which has a front and section 14 attached thereto by bolts 15 or the like, the latter section being an integrally cast member including an electromagnet frame portion 16. Shaft 12 is journaled at its forward end portion 17 in the front end section 14 in any conventional manner such as by ball bearing means 18. Pinion 19 is keyed onto the forward end 20 of shaft 12 and has a pair of friction disks 21, 22 slideably disposed in a co-axial relation on the periphery thereof and in meshing engagement with the splined surface 23 of pinion 19. Three stationary disks are disposed in interleaving fashion relative to the rotating disks 21, 22. They are end disks 24, intermediate disk 25, and magnetic armature disk or plate 26 which are slideably mounted on the housing front end section 14 by three bolted brake studs 27 and 28 (only two shown) for axial movement relative to the rotating disks, 21, 22 to provide braking action as will be described hereinafter. Coil spring means 29 concentrically disposed on shafts 27, 28 (one shown) bias armature plate 26 outwardly or to the left as viewed in Figs. 1—2.

Recessed within electromagnet frame 16 is the DC electromagnet winding 30. Rectified AC current is supplied to the electromagnet winding from the three-phase AC stator winding 11 through rectifier means 31 shown in Fig. 4. The stator winding 11 is

the conventional Y connected arrangement having respective windings 32, 33 and 34 capable of operation on 440 volts, or on 220 volts by use of center taps on each winding as shown. Diodes 35, 36 are connected respectively to the 220 volt center taps on windings 33, 34 and are connected to common point 37. DC electromagnet winding 30 is connected at one end to the stator neutral 38 and at the other end to the common connection 37. With this arrangement it is possible to use only two diodes instead of four which would normally be required in a full wave bridge rectifier circuit.

In operation, the brake means functions in a conventional manner. Without energizing voltage supplied to the stator windings, motor shaft 12 is stationary and held in that position by the brake means, spring 29 compressing the rotatable disks 21, 22 in a sandwiched relation between stationary disks 24, 25 and 26. Upon application of the three-phase AC voltage to the stator winding 11, rectified DC current is immediately applied to electromagnet 30 which is thereby energized and pulls armature disk 26 to the right as viewed in Fig. 1 and causes the release of frictional pressure on rotating disks 21, 22. Thus, armature 12 is free to rotate in response to the energized stator.

Whenever the AC energizing voltage is cut off, the electromagnet winding 30 releases armature 26 and coil spring 29 once again compresses disks 21, 22 between the stationary disks 24, 25 and 26, immediately braking shaft 12 to a stop.

The present invention provides an integrally cast magnet frame and motor housing which eliminates all the machinery and mounting problems heretofore associated with an AC brake or a separately mounted DC brake and further provides a shorter, quieter, more reliable unit. By connecting the DC electromagnet winding permanently to the lower voltage taps on the 220/440 volt motor or any dual voltage motor, standardization of the brake electrical design is permitted and use of lower peak inverse voltage diodes makes the brake design practical from an economical standpoint.

WHAT WE CLAIM IS:—

1. Electric motor apparatus including a multi-phase AC motor having a stator and a multi-phase winding thereon, a rotor including a shaft portion, a housing enclosing said motor, DC brake means for the motor mechanically coupled to the rotor shaft, said brake means including an electromagnet frame integrally formed with said housing, a DC electromagnet winding on said frame, and a plurality of rectifier means interconnected between a stator phase winding and a common point, said DC winding bridging said common point and the stator neutral, for supplying rectified DC current to energise said electromagnet during operation of said motor.

2. Apparatus according to claim 1, wherein the DC brake means includes braking elements mechanically coupled with said shaft, spring means biasing said elements to a braking position relative to such shaft, the braking elements being held in a non-braking position by said electromagnet upon energisation thereof.

3. Apparatus according to claim 1 or claim 2, in which the motor is a three-phase AC motor having a three-phase winding on the stator with a neutral connection.

4. Apparatus according to claim 3, in which the rectifier means is constituted by a pair of unidirectional current means each connected between a stator phase winding and a common point, said DC winding bridging said common point and the stator neutral.

5. Apparatus according to claim 3 or claim 4, in which the electromagnet frame is integrally cast with the housing and the rectifier means is on said motor and constituted by a pair of diodes each connected between a stator phase winding and a common point, said DC winding bridging said common point and the stator neutral.

6. Apparatus according to claim 1, substantially as shown and described.

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Fig.1.

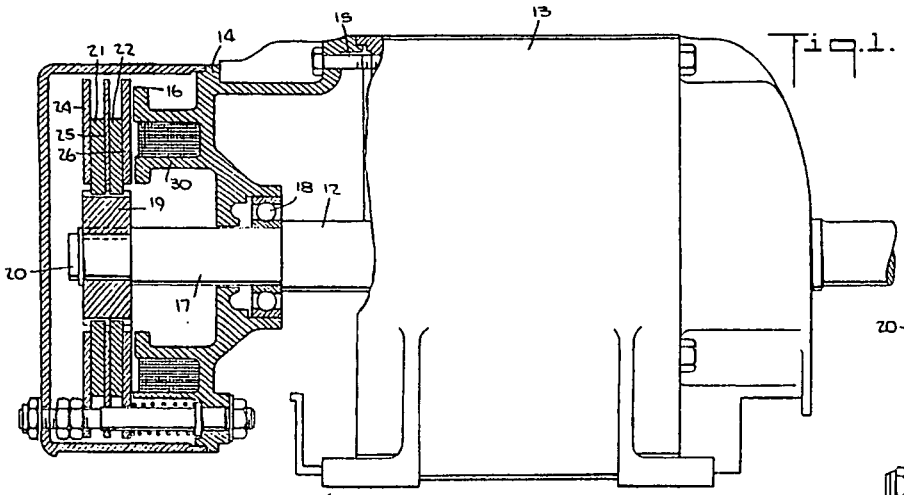


Fig.2

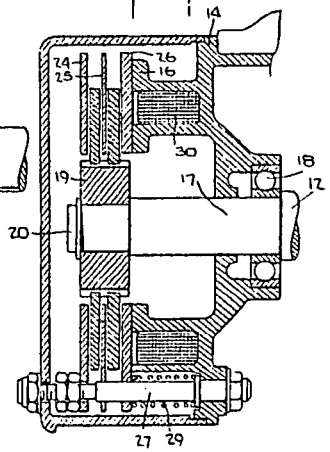


Fig.3.

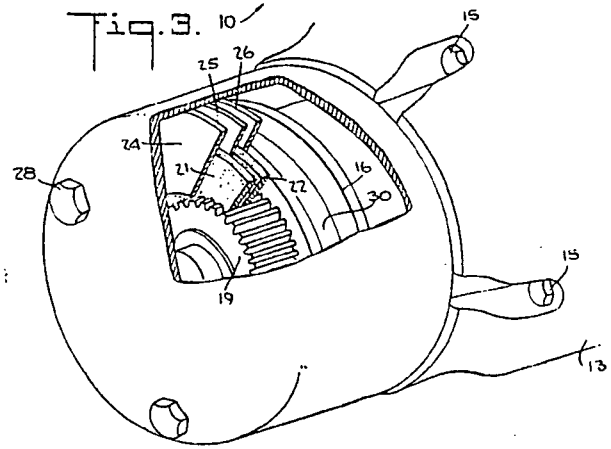
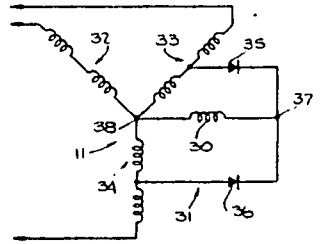


Fig.4.



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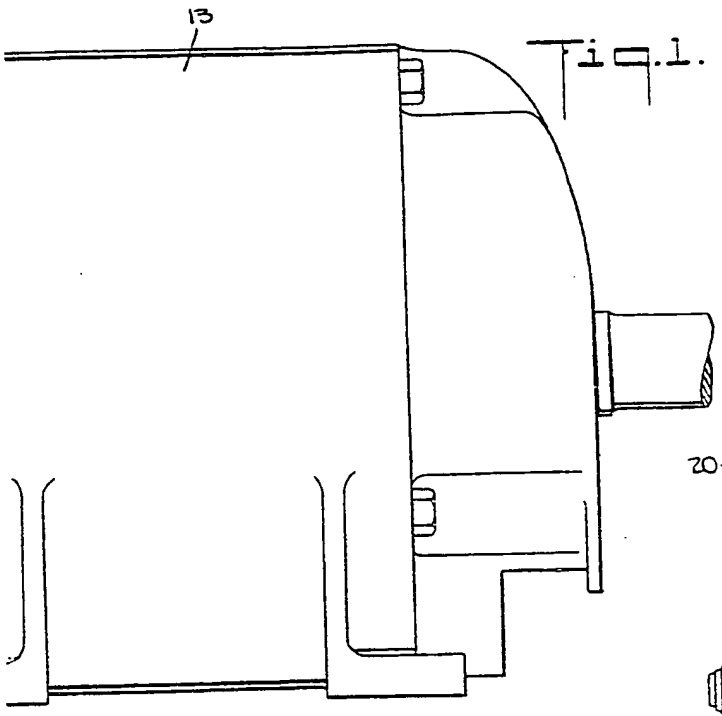
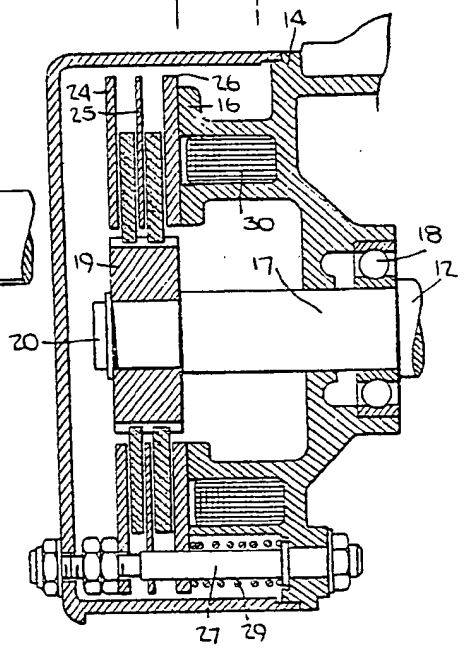


Fig.1.

Fig.2



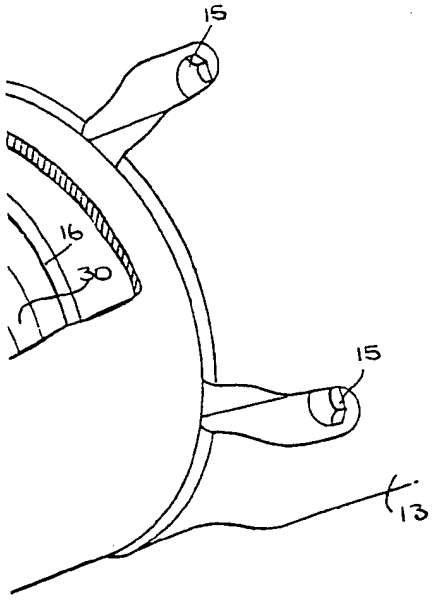


Fig.4.